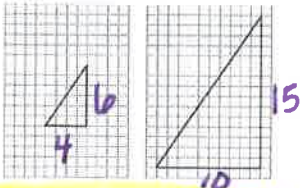
4.2.3 How can I compare them?

Enlargement and Reduction Ratios

In the last lesson, you enlarged and reduced images while preserving their shapes. By doing so, you created **similar figures**. If you want to compare side lengths of similar figures, one way to do so is by using **ratios**.



4-63 Andrew, Barb, Carlos, and Dolores were looking at the similar triangles at right. **"Similar"** in this context means that the triangles have the same shape, but they are different sizes. They are working together to describe the relationship between the two triangles.

"Hey,"Barb said, "I just learned about ratios from my sister. She told me that ratios are another way to compare quantities like the dimensions of these triangles. We could compare these triangles by setting up the ratio of 4 units to 10 units. We can write it in these ways."

4 : 10

$\frac{4}{10}$

4 to 10

Carlos wondered, *"But wait, why wouldn't the ratio be 6 to 15?"*

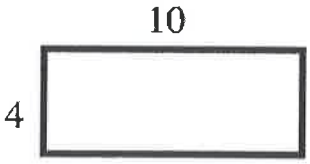
a) Where did Barb and Carlos get the numbers that they are using in their ratios? What are they comparing?

b) Whose ratio is correct? How do you know?

c) What are some other ratios that represent the same relationship as 4:10? Work with your team to find at least three equivalent ratios.

4-68. Investigate: You have discovered that when you enlarge a figure, the ratio of side lengths between the original and the enlargement stay the same. What about the perimeters? What about the areas?

a) Find the perimeter and area of the rectangle at right.



b) Draw a new rectangle that is a reduction of the rectangle at right, so that the ratio of the sides of the original rectangle to the new one is 4:2. Label the length and width.

c) Find the perimeter and area of the new, smaller rectangle.

d) Write the ratio of the original perimeter to the new perimeter. Then write the ratio of the original area to the new area. Are the ratios equivalent?

4-63 a) Barb got her ratio from the width and Carlos got his from the height. They are comparing the similar triangles.

Key Idea:
- Ways to Write a Ratio -
4:10 $\frac{4}{10}$ 4 to 10

b) They are both correct. I can tell by counting the width and height of the triangles in the picture.

c) $\frac{4}{10} \div \boxed{\frac{2}{2}} = \frac{2}{5}$ $\quad \frac{4}{10} \cdot \boxed{\frac{2}{2}} = \frac{8}{20}$

$\frac{2}{5} \cdot \boxed{\frac{3}{3}} = \frac{6}{15}$

Three equivalent ratios are: $\frac{2}{5}, \frac{6}{15}, \frac{8}{20}$

• I used the Giant One Strategy.

4-68 a) The perimeter is 28 units and the area is 40 sq. units.

Area: $10 \times 4 = 40$

Perimeter: $10 + 4 + 10 + 4 = 28$

b) $2\frac{\square}{5}$

c) The perimeter is 14 units and the area is 10 sq. units.

d) $\frac{\text{original perimeter}}{\text{new perimeter}} = \frac{28}{14} \div \boxed{\frac{2}{2}} = \frac{14}{7} \div \boxed{\frac{7}{7}} = \frac{2}{1}$ } The perimeter is equal to the original, but the area is not.

$\frac{\text{original area}}{\text{new area}} = \frac{40}{10} \div \boxed{\frac{10}{10}} = \frac{4}{1}$